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CLIP FOR DEFROSTER-HEATERS

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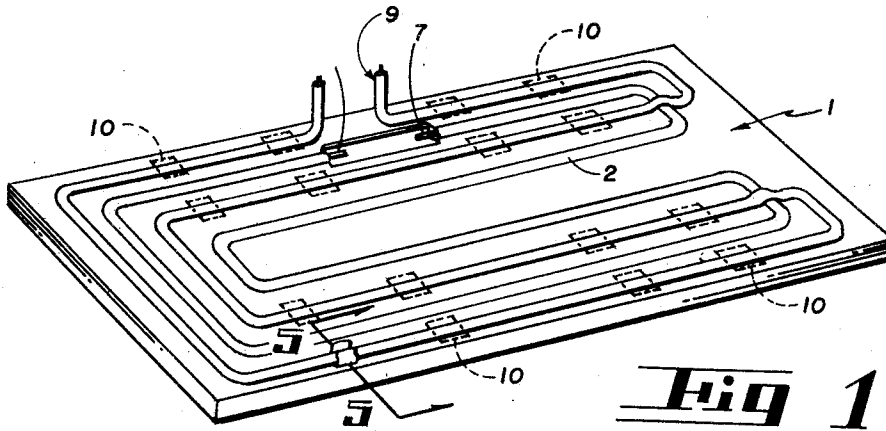


Fig 1

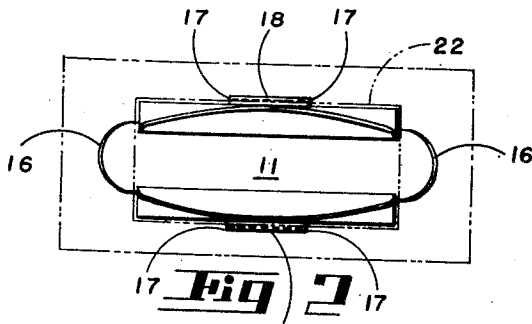


Fig 2

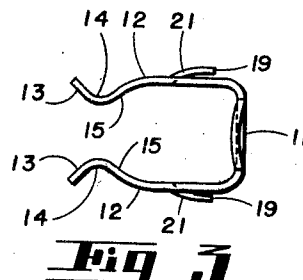


Fig 3

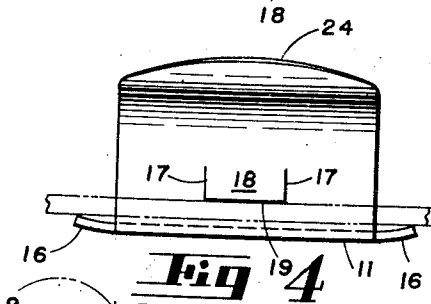


Fig 4

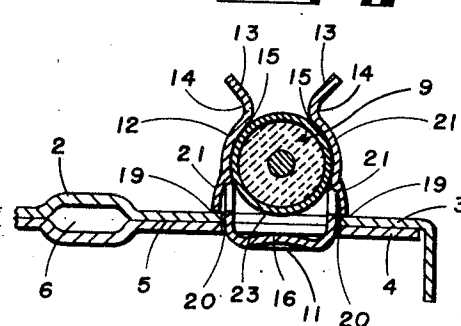


Fig 5

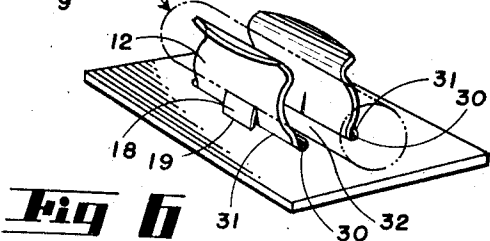


Fig 6

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CLIP FOR DEFROSTER-HEATERS

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3 Claims. (Cl. 248—54)

The present invention relates to a fastener and, more particularly, to a resilient clip designed to secure a defroster-heater to the surface of an evaporator.

It is commonplace today to utilize electrical heating elements for melting frost accumulations from evaporators of domestic refrigerators. As is well-known, such frost accumulations are objectionable since they serve as insulation retarding heat transfer to the evaporator. The heating elements provided to remove the frost are usually energized periodically whereby the frost is removed at regular intervals and no sizable quantity is permitted to accumulate.

Attachment of defroster-heaters to evaporators has at times presented a problem. The earliest form of heaters comprised relatively rigid metallic tubular sheaths surrounding magnesium oxide insulation in which was imbedded an electrical resistance wire. This type of heater was relatively rigid and was clamped to the evaporator by flanges and similar fittings connected integrally with the evaporator. At a later time, flexible defroster-heaters were evolved which conformed to the surface of an evaporator more readily. This type of heater could readily be clamped by resilient clips directly to refrigerant channels projecting from the evaporator.

Evaporator design has also influenced the type of fastener used to attach defroster-heaters to evaporators. A recent trend in evaporator design has been toward the use of forge welded evaporator plates. Such evaporators are sometimes identified as "roll bonded." In such evaporators refrigerant channels, or passages, are formed by hydraulically inflating aluminum sheets along a predetermined pattern applied to the sheets prior to homogeneous joining of the sheets through rolling. The refrigerant passages of such an evaporator are relatively flat and do not project significantly from the surrounding surfaces of the evaporator and do not lend themselves to direct attachment of defroster-heaters.

This type of evaporator then poses a serious problem from the standpoint of defroster-heater attachment. The problem is accentuated by the fact that roll bonded evaporators normally employ soft aluminum making undesirable threaded fasteners. The softness and relative weakness of the material also militates against formation of flanges or other fasteners directly from the evaporator material itself.

In view of the foregoing, it is an object of the present invention to provide an improved means for attaching defroster-heaters and similar elongated members to the surfaces of evaporators and comparable devices.

More specifically, it is an object of the present invention to provide an improved resilient clip for attaching a defroster-heater to the surface of an evaporator.

In a more limited sense, it is an object of the present invention to provide a resilient clip for attaching a tubular defroster-heater in intimate thermal contact with the surface of a roll bonded evaporator.

More specifically still, it is an object of the invention

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to provide a spring clip which can be forced into locked engagement with an opening formed in an evaporator plate to provide resilient clamping surfaces for holding a defroster-heater in intimate contact with its surface.

The novel features that I consider characteristic of my invention are set forth in the appended claims; the invention itself, however, both as to its organization and method of operation, together with additional objects and advantages thereof will best be understood from the following description of specific embodiments when read in conjunction with the accompanying drawings in which:

Figure 1 is a perspective view of a roll bonded evaporator plate to which is attached a defroster-heater by means of clips made in accordance with the present invention;

Figure 2 is a top plan view of the preferred embodiment of the clip, a section of an evaporator plate surrounding the clip being shown in phantom lines;

Figure 3 is an end view of the clip shown in Figure 2; Figure 4 is a side elevational view of the clip shown in Figure 2;

Figure 5 is a cross sectional view of the clip installed in an evaporator plate, the view being taken on plane 5—5 of Figure 1; and

Figure 6 is a perspective view showing the clip installed in an evaporator plate in an alternate manner.

Referring first to Figure 1, there is shown an evaporator plate, generally designated 1, defining a sinuous refrigerant passage 2. The evaporator plate as illustrated is of the forge welded or roll bonded construction with which the present invention finds particular utility. It should be understood, however, that the present invention finds utility in other applications and is not limited to the use illustrated.

The construction of a roll bonded evaporator can be understood by reference to Figure 5 which shows metal sheets 3 and 4 intimately bonded along surface 5. Shown in Figure 5 is a refrigerant flow channel or passage 6. It will be noted that the channel is relatively flat and does not project significantly beyond the adjacent surfaces of the evaporator.

As will be understood by those skilled in the art, liquid refrigerant is introduced at 7 to one end of the refrigerant passage and is removed in vapor form from the other end of the passage shown at 8. This naturally lowers the temperature of the evaporator 1 which, during use, may tend to accumulate frost through deposition of moisture from the surrounding atmosphere.

To remove such frost, there is provided an electrical defroster-heater, generally designated 9. The defroster-heater, as illustrated in Figure 1, has a sinuous form and is interspersed between the passes of the refrigerant channel. In this way, heat can be transferred during defrosting throughout the evaporator and the frost can be completely removed. The heater may be energized through a time clock and thermostats (not shown) which will not be described since they do not concern the present invention.

The defroster-heater is secured to the evaporator by means of a plurality of clips, the locations of which are indicated by dash lines at 10. It will be noted that a plurality of clips are provided to hold the heater closely adjacent to the evaporator surface thereby assuring good heat transfer.

The details of an individual clip can now be considered. With reference to Figures 2 through 4, it will be noted that the clip includes a relatively planar base portion 11 from which project perpendicular sides 12. The sides terminate in flared distal ends 13 which are

defined in part by re-entrant portions 14. The re-entrant portions also define resilient clamping surfaces 15 which engage the defroster-heater when it is installed on the evaporator.

The clip also includes as extensions of the base ears 16 which may either lie in the plane of the base or be inclined slightly towards sides 12, as indicated in Figure 3. The purpose of these ears will be explained shortly. The sides of the clip are lanced, as at 17, to define detents 18 having shoulders 19 for a purpose to be described.

Attention should now be directed to Figure 5. It will be noted that an opening 20 is provided in sheets 3 and 4 to receive the clip. The clip is inserted from the bottom side of the evaporator (as viewed in Figure 5) through opening 20 until ears 16 are brought into bearing engagement with the bottom surface of the evaporator and shoulders 19 snap into locked engagement with the top surface of the evaporator. As the clip is inserted through the opening, the sides are deflected inwardly by the upper curved surfaces 21 of the detents which are forced into bearing engagement with the sides of opening 20. As the clip reaches its home position, the detents clear the top of the evaporator and the sides tend to return to their original position.

As has been mentioned, ears 16, before installation of the clip, may be deformed slightly towards sides 12. By so forming the ears, intimate bearing engagement is assured with the bottom side of the evaporator and also possibility of these ears presenting sharp cutting edges is avoided. Further, the ears impart force to the clip when installed, tending to hold shoulders 19 in intimate engagement with the top of the evaporator. This feature is, however, optional.

All of the clips can be made in exactly the same manner. As suggested by phantom outline 22 of Figure 2, the openings formed in the evaporator should be rectangular and have such proportions as to permit passage of the sides 12 of the clips while assuring engagement of ears 16 and shoulders 19 with the evaporator surfaces when the clips are fully installed.

Attention should again be directed to Figure 5. Shown here in cross section is defroster-heater 9 in installed engagement with the clip. It will be noted that the defroster-heater conforms closely to the curved clamping surfaces 15 and is held in intimate engagement with the surface of the evaporator at 23. It is important that intimate heat transfer engagement be established in the interest of efficient defroster-heater operation. Since the spring clips are made from resilient stainless steel, it is a relatively simple matter to force the defroster-heater past re-entrant portions 14 and into locked engagement with the clamping surfaces. As also illustrated in Figure 5, the sides of the clip are deflected outwardly holding shoulders 19 in tight engagement with the evaporator.

During installation of the defroster-heater the flared distal ends of the clips serve to guide the heater through the oppositely disposed re-entrant portions 14. As indicated in Figure 4, these distal ends may be curved, as shown at 24, so that no sharp corners project significantly above the heater when installed. This is a safety measure to protect the user of the refrigerator in which the evaporator is installed.

An alternate installation of the clip is shown in Figure 6. Here a pair of rectangular parallel slots 30 are formed in the evaporator plate. Sides 12 of the clip are passed

through the slots, the outer edges 31 being spaced to insure engagement of shoulders 19 of detents 18 with the top surface of the evaporator. Such an installation eliminates the necessity of ears 16 since base 11 of the clip rests in engagement with the bottom of portion 32 intervening between slots 30. This installation has the advantage of providing additional surface area in direct thermal engagement with the defroster-heater.

It will be noted that through use of the present clips a defroster-heater can be quickly and securely installed on an evaporator. It is a simple matter to force the clips in the openings provided in the evaporator and then to force the defroster-heater into engagement with each of the clips. It has been found from actual tests that once installed the clips remain tightly engaged with the evaporator. The defroster-heater can be attached to or removed from the evaporator at will which facilitates not only initial installation but also subsequent inspection and repair.

It should be understood that the present invention may be used to attach a defroster-heater, or any similar device, to any member through which an opening may be formed to receive the clip. The invention is characterized by versatility since the clips may be readily arranged in any desirable pattern to position a defroster-heater as may be required for complete frost removal from an evaporator. As will be evident from the drawings, the clip is simple to construct and install and inherently economical. In its most usual installation, the base 11 of the clip would face the interior of a freezing compartment bounded by the evaporator. It will be appreciated that the relatively flat and unobtrusive base presents a pleasing appearance and is not dangerous or undesirable in any way.

The various features and advantages of the structure disclosed are thought to be clear from the foregoing description. Other features and advantages, not specifically enumerated, will undoubtedly occur to those versed in the art which may be achieved without departing from the spirit and scope of the invention as defined by the following claims.

I claim:

1. A clip comprising a base, sides projecting perpendicularly from said base, said sides terminating in flared distal ends, said distal ends being formed in part by re-entrant portions of said sides, said re-entrant portions also defining clamping surfaces on the interior of said sides, an outwardly projecting detent lanced out of each side and ears projecting substantially co-planar from the ends of said base.

2. Apparatus as defined in claim 1 in which said ears are deformed towards said sides.

3. Apparatus as defined in claim 2 in which said flared distal ends are curved to minimize sharp corners at the junction of said flared distal ends and said re-entrant portions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,704,075	Brown	Mar. 5, 1929
2,004,679	Tinnerman	June 11, 1935
2,166,916	Lombard	July 18, 1939
2,227,761	Roethel	Jan. 7, 1941
2,244,976	Tinnerman	June 10, 1941
2,592,394	Cochran	Apr. 8, 1952